# The Role of Supplier Quality in e-Procurement Negotiation

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## ABSTRACT

**Purpose:** The purpose of this study is to examine the significance and the role of supplier rating as a formalised supplier quality measure to achieve better-negotiated prices and to identify price premium resulting from improved rating.

**Methodology/Approach:** Data from real B2B environment of electronic reverse auction SW solution ProeBiz were obtained and processed. Data from the reverse rating approach were used where the default rating value is 1 and improvements of rating lead to decreasing the rating value. Except standard descriptive statistics, non-parametric correlation and Kruskal-Wallis tests, the knowledge discovery techniques by decision trees CHAID algorithm were used.

**Findings:** From our empirical research results, there is the evidence of a significant positive relation of supplier quality or rating improvements on a negotiated price for suppliers. Improving rating from the default value (1.00) to (0.98-0.95) can lead to better- negotiated prices for suppliers in English auction expressed as price premium in the value of 4%.

**Research Limitation/implication:** Research has several limitations, esp. in the size of the sample and sectorial view as the research is based on data from construction, electro-mechanics and logistics sector.

**Originality/Value of paper:** The paper is original and not published in other publications.

**Category:** Research paper

**Keywords:** rating; supplier quality; electronic reverse auction; price premium; e-procurement

# 1   INTRODUCTION

There is now a wide range of concepts and theories that analyse the economic aspect of trust in society. The importance of trust for society is being investigated by many sociologists, economists, political scientists and others. From the economic point of view, it is considered primarily as a factor that influences the dynamics and formation of economic processes, reduces transaction costs and eliminates barriers to cooperation.

Fukuayma (1995) discusses that differences in the economic performance of individual countries result from differences in their propensity to build trust-based relationships. Trust involves accepting the risk of interaction. If we perceive trust as intellectual property of an individual, its determinants are primarily the personal, value and emotional characteristics of the individual. On the other hand, "trust is perceived as systemic ownership of the company and its central institutions".

The importance of trust has been confirmed in researches from many scientific disciplines such as sociology, political science, economics, philosophy and in various areas of management. In management, trust is perceived as an important factor affecting communication, leadership, negotiation, working relationships, etc..

Knack and Zack (2003) discuss that "greater interpersonal confidence affects the decline in transaction costs associated with investment activities in the country, ultimately affecting economic growth".

The conclusions of many scientific papers on the study of trust and its position in the economy clearly show that "high-confidence companies have a higher rate of investment and growth".

On the basis of a summary of the above statements, we can assume that a high level of confidence in a country has a positive effect on the development of some macroeconomic indicators. Although the modern socio-economic approach to trust is often criticized because of the ambiguity of the conclusions, it is probably the most successful modern concept in economic theory in recent decades (Locke, 2001).

Many economists are currently discussing how to achieve an optimum level of confidence and thus stimulate its economic growth. However, several studies are shifting this issue into B2B relations and examining how trust in supplier quality can determine the economic performance of B2B relations and total corporate performance (Santos, Murmura and Bravi, 2019; AlMaian et al., 2016; Charki and Josserand, 2006). The purpose of the vendor rating is to manage, measure and improve the quality level of the supplier's performance.

Although many studies are focused on how to measure or apply rating systems to measure supplier quality, only a few are examining the following impact of this quality measurement values on negotiation results and vendor selection.

The diagram in Figure 1 illustrates the possible effects of trust on some key factors such as e.g. investment, human capital management, transaction costs, collective organization and collaboration, all of which determine economic prosperity and economic growth.
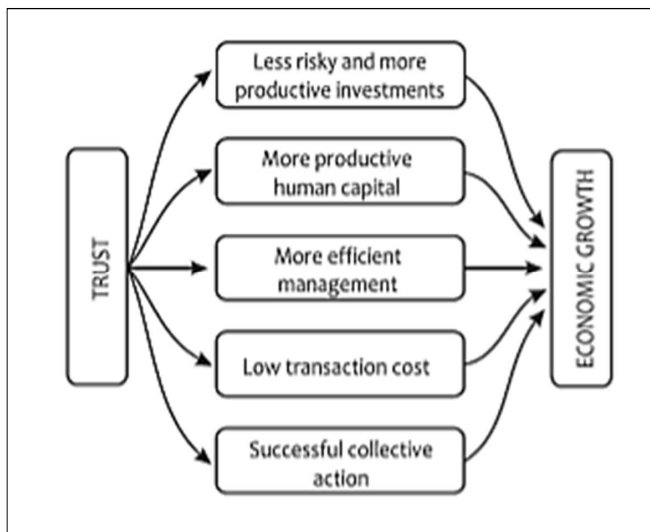


*Figure 1 – Trust and Its Economic Importance (Lekovic, 2012)*

## 2   IMPACT OF RATING AND TRANSPARENCY

The result of a transparent process is to build stable and healthy relationships with suppliers. However, in many cases, the use of e-auctions to select a supplier disrupts long-term relationships with current suppliers. There is the possibility of using e-auctions as a tool for researching the market prices of purchased goods and services. Buyers can use this information to negotiate with the current supplier about better purchasing conditions.

From this point of view, a company must consider how the change will have the influence – deterioration of relations with current suppliers.

It should be considered whether they are strategic or non-strategic suppliers, i.e. regular suppliers. It is not advisable to use e-auctions for strategic suppliers. Mainly, these are suppliers of critical and low-value goods and services. For non-strategic suppliers, however, the use of e-auctions is more than just a good choice. In such cases, the buyer's power to negotiate is increasing, the supply markets are differentiated and allow the use of negotiation tactics (Schwarts, 2001). Such "tactical" and premeditated actions to abuse the other party result in worsened supplier-customer relations.

Beall et al. (2003) pointed to the paradox that more vendors than buyers believe in a deteriorated supplier-supplier relationship due to the use of e-auctions. In e-commerce, the established mechanism is a rating, which makes it possible to

evaluate a partner's behaviour after a business transaction. The rating can thus be considered a mirror of distrust and reflection of past experience (Tsai and Chow, 2011; Dorčák, Pollák and Szabo, 2014; Szabo, 2015; Santos, Murmura and Bravi, 2019; AlMaian et al., 2016).

The rating system is based on the feedback that is given at the end of each completed transaction and tells the participant's behaviour during the transaction. All submitted evaluations are accumulated into one value, which serves to support decision-making in the selection of the final supplier. Delarocas (2006) argues that this is a feedback system in which information and experience are shared in order to limit future unfavourable choices. Most often it is a numerical rating or star rating, supplemented by a verbal description of the course of trade. At present, such an evaluation mechanism is (according to our information) implemented and used in the evaluation of e-auction in only a few companies.

The evaluation of suppliers has an impact in two main ways:

- The rating has a discriminatory effect, in that it helps to distinguish differences between suppliers and thus you would better avoid it.

- The rating has a predictive effect, in the sense that a rating that has already been received indicates that it will be successful in the future. Reputations very important information in two points of view. It:

  – assists the e-auction participant (advertiser, buyer) in the decision-making process among several sellers who have submitted relatively similar offers for the same product.

  – supports the process of eliminating occasional (negative) supplier behaviour which would be unprofitable in the long term as it would lead to the rating downgrade and discouraging business partners from future cooperation.

## 3   METHODOLOGY

The database used after modification contains 110 records from e-auctions which were realised mainly in the fields of construction, electrical material and transport services. All 110 records were realised by electronic reverse auction ERMMA with information of supplier rating.

The database is gathered from e-auction SW provider NAR Marketing, as the biggest central European company in this field. Although the data are much bigger, the samples with real rating usage were only in 110 procurements. It is interesting, that they are only from 3 sectors (esp. logistics).

The supplier rating is used for negotiation in an electronic reverse auction in the way, that the individual bids/prices of the bidders are multiplied by their rating value. It means, each supplier starts with rating 1 and in the case, the supplier is satisfied with the supplier, he will decrease the rating of supplier and vice versa.

The mechanism of rating implementation in electronic negotiation is set up in the way, that the price of supplier is multiplied by the rating and in this situation, the lower rating improves the final price and helps suppliers to get on higher ranks.

*Table 1 – The Description of Research Sample*

|  | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| *Auction savings* | 112 | -0.0110 | 0.4773 | 0.071880 | .0965243 |
| *NoParticipants* | 112 | 1 | 16 | 8.74 | 2.955 |
| *WinnerRating* | 112 | 0.950 | 1.030 | 0.96393 | 0.023341 |
| *WinnerRatingPosition* | 112 | 0.986 | 1.026 | 1.00112 | 0.009007 |
| *AvgRating* | 112 | 0.95 | 1.01 | 0.9628 | 0.02079 |
| *MedianRating* | 112 | 0.95 | 1.01 | 0.9587 | 0.01929 |
| *Valid N (listwise)* | 112 |  |  |  |  |

## 4   RESEARCH AND DISCUSSION

Within this study, we are examining the role of rating as one of the transparency settings on final auction performance measured by the winning contract at the negotiated price.

For this purpose, we have to analyse the relation between rating values against winning price reduction (auction savings). In our sample, we have two types of savings: total and auction saving. Total savings are calculated from multi-round negotiations, where the first round is still a market survey (using sealed bids). The best price is used as an input price for ERMMA negotiation in the second round.

For our analysis, on the base of attributes directly gathered from the database, we have also calculated derived attributes useful for our working question:

- *NoParticipants* – the number of participants involved in the procurement process;

- *Winnerbid* – the volume or price of the winner within the negotiation;

- *AllRatingsWinner* – the rating of the winner;

- *WinnerRatingPosition* – rating position within the interval of all participants' ratings calculated as *AllRatingsWinner/AvgRating*;

- *AvgRating* – average rating within all participants in a specific negotiation;

- *MedianRating* – the median of ratings of all participants in a specific negotiation.

As we see from the non-parametric correlation test using Spearmann in Table 2, almost all attributes were correlated with auction savings on a significant level. Only winner rating position is not relevant. The highest correlation from rating attributes is visible by the rating of the winner as the most generic, although the knowledge behind will be explained later.

*Table 2 – The Correlation Matrix*

| | | *No Participants* | *Winnerbid* | *All Ratings Winner* | *Winner Rating Position* | *Avg Rating* | *Median Rating* |
|---|---|---|---|---|---|---|---|
| *Auction savings* | Coeff | 0.222 | -0.403 | 0.363 | 0.142 | 0.392 | 0.273 |
| | Sig. | 0.020 | 0.000 | 0.000 | 0.140 | 0.000 | 0.004 |
| *NoParticipants* | Coeff | 1.000 | 0.150 | 0.123 | -0.190 | 0.355 | 0.242 |
| | Sig. | . | 0.114 | 0.197 | 0.045 | 0.000 | 0.010 |
| *Winnerbid* | Coeff | | 1.000 | -0.259 | -0.244 | -0.173 | -0.189 |
| | Sig. | | . | 0.006 | 0.010 | 0.068 | 0.046 |
| *AllRatings Winner* | Coeff | | | 1.000 | 0.570 | 0.769 | 0.808 |
| | Sig. | | | . | 0.000 | 0.000 | 0.000 |
| *WinnerRating Position* | Coeff | | | | 1.000 | 0.012 | 0.211 |
| | Sig. | | | | . | 0.904 | 0.025 |
| *AvgRating* | Coeff | | | | | 1.000 | 0.661 |
| | Sig. | | | | | . | 0.000 |

As we have only 4 significant levels of ratings (the most negative 1.03 has only one winner in one procurement record) looking as an ordinal attribute we have applied non-parametric Kruskal-Wallis test to identify if there exist significant differences in statistical distributions against auction savings achieved. The result shows, that it is statistically significant on 0.03 level. When we are looking deeper in the descriptive statistics using boxplots, comparing winners' ratings with auction savings we can see, that the difference is quite clear and it provides the information that increasing winners rating leads to increased auction savings. It means, that to win the tender the supplier with a higher rating has to reduce his price significantly against suppliers with better rating values.
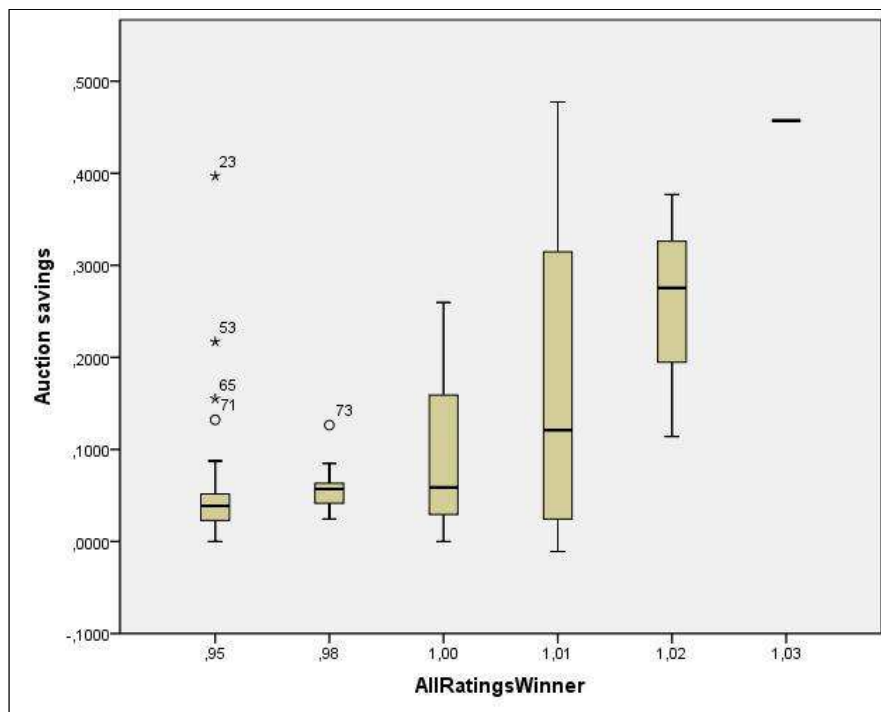
*Figure – 1 Boxplot Analysis of Ratings vs. Savings*

When comparing these results to the median of the whole sample which is 0.428, these statistics also provide additional information.

*Table 3 – The Description of Research Sample*

|  |  | **Auction savings** | | | |
|---|---|---|---|---|---|
|  |  | Mean | Median | Mean total | Median total |
| *AllRatingsWinner* | 0.95 | 0.0471 | 0.0388 | 0.719 | 0.428 |
|  | 0.98 | 0.0585 | 0.0571 | 0.719 | 0.428 |
|  | 1.00 | 0.1061 | 0.0587 | 0.719 | 0.428 |
|  | 1.01 | 0.1822 | 0.1209 | 0.719 | 0.428 |
|  | 1.02 | 0.2554 | 0.2753 | 0.719 | 0.428 |
|  | 1.03 | 0.4572 | 0.4572 | 0.719 | 0.428 |

We can see, that the value of positive rating brings suppliers price premium, e.g. ratings on average 0.95 help the supplier to achieve on average 24.8% price premium or more realistically using median of 4% price premium. To support these results we were also using knowledge discovery techniques, esp. decision tree CHAID algorithm using entropy reduction approach for the classification of the most significant rules in the dataset. Results are presented in Figure 1.
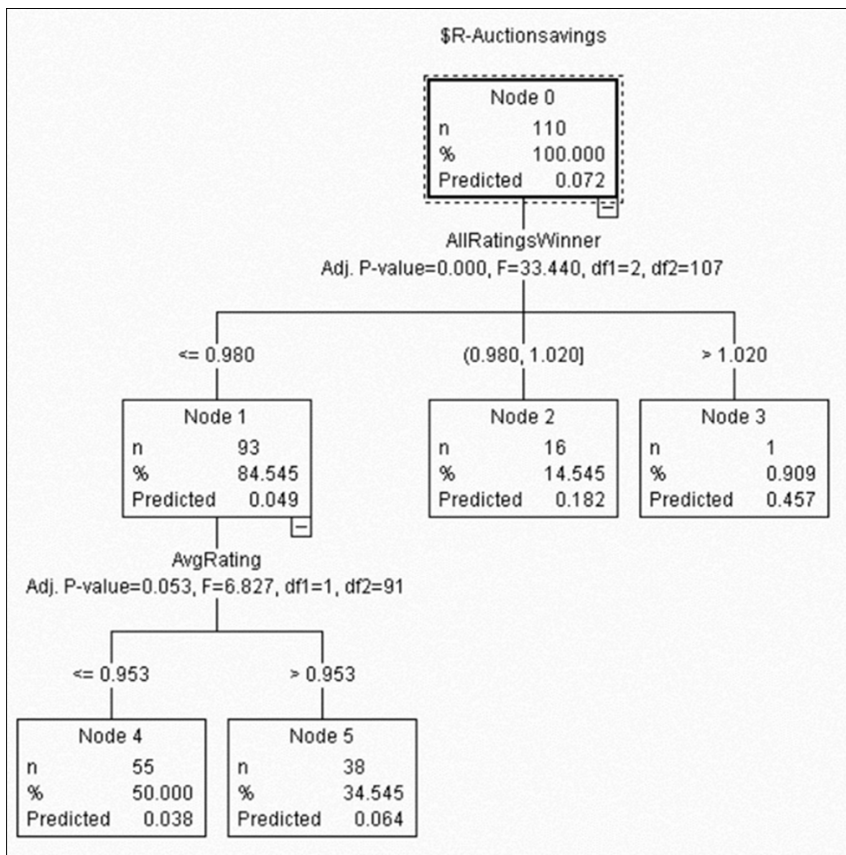
*Figure 2 – Decision Tree (Rules) Results Using CHAID Algorithm*

Using a decision tree or decision rules algorithm and interactive model by SPSS Clementine SW, the model presents the most significant decision rules on the significance of the rating related attributes with all inputs mentioned above. We see, that on the base of F-test, there are two significant basic clusters of rules (again, the third cluster is based only on one observation) where the most significant is the rating of the winner in two classifications. The simplified presentation should be stated as follows: in the case of a higher rating than one (default/neutral rating), the price premium rises to the value of 5%. Although in this sample there is also an interesting conditional rule that provides the information where the better average rating of suppliers within specific negotiation leads to an additional 1% premium.

## 5   CONCLUSION

This study was focused on empirical research into the role of ratings as a measure of supplier quality in B2B procurement negotiations based on data from real reverse auction environment in Slovak and Czech Republic.

Research results using also decision trees CHAID algorithm revealed significant importance of the supplier rating on the possibility to achieve price premium. From our analysis, we can formulate the conclusion, that improving rating can lead to 4% price premium for a supplier. This result shows the role of improved supplier quality and its potential to negotiate better contract condition.

## ACKNOWLEDGEMENTS

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R.D. – concept, oversight, leadership, research activity planning, execution, design, methodology; M.M., P.H. and J.S. – formal analysis, manuscript writing.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.